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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,667	08/31/2001	Shuichi Kikuchi	10417-094001	1120

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EXAMINER
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THOMAS, TONIAE M

ART UNIT	PAPER NUMBER
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2822  
DATE MAILED: 04/08/2003

8

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	09/943,667	KIKUCHI ET AL.
	Examiner	Art Unit
	Toniae M. Thomas	2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 21 January 2003.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-3 and 8-14 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 1-3 and 8-14 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on 21 January 2003 is: a) approved b) disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

#### Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some \* c) None of:

1. Certified copies of the priority documents have been received.

2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

#### Attachment(s)

1) Notice of References Cited (PTO-892)  
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.

4) Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_  
5) Notice of Informal Patent Application (PTO-152)  
6) Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Introduction***

1. This Office action is responsive to the amendment filed on 21 January 2003. The amendment cancelled claims 4-7, and added claims 8-14. Currently, claims 1-3 and 8-14 are pending.

### ***Drawings***

2. As discussed in the Office action mailed on 13 September 2002, the drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 5B (fig. 2). A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 21 January 2003 have been disapproved. The proposed drawing correction does not include the correction discussed above, which was made of record in the previous action (see page 2, section no. 3 of the action mailed on 13 September 2002).

***Sp cification***

4. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the disclosure is objected to because it contains the word "said" (line 7). The phrase "said gate electrode" should be changed to "the gate electrode." Correction is required. See MPEP § 608.01(b).

5. The abstract is also objected to because of the following: "second" should be changed to "first" (line 5). The second low concentration drain region is close to the outer boundary of the first low concentration drain region. Correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. *Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.*

The term "far" in newly added claim 9 is a relative term, which renders the claim indefinite. The term "far" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term "far" renders indefinite the limitation of "the third drain region being spaced apart from the outer boundary of the second drain region."

The phrase "the third drain region" in newly added claim 8 lacks antecedent basis (claim 8, line 2).

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. *Claims 1, 8-11, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawaguchi et al. (US 5,932,897 B1).*

#### Regarding Claims 1, 8, 10, 11, and 14

Kawaguchi et al. disclose a semiconductor device (fig. 3 and col. 5, line 50 – col. 6, line 19). The device comprises the following elements substantially as claimed: a gate electrode 19 formed on a first conductivity type semiconductor 11 substrate through a gate oxide film 17 (fig. 3); a first low concentration drain region 14 of a second conductive type, provided at one end of the gate electrode (fig. 3 and col. 5, lines 58-

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61); a second low concentration drain region 15 of the second conductive type, provided in the first low concentration drain region, the second low concentration drain region being disposed close to an outer boundary of the first low concentration drain region and being higher in impurity concentration than at least an impurity concentration of the first low concentration drain region (fig. 3 and col. 5, lines 61-64); a high concentration source region 13 of the second conductive type provided at another end of the gate electrode (fig. 3 and col. 5, lines 55-57); and a high concentration drain region 16 of the second conductive type formed in the second low concentration drain region, the high concentration drain region being spaced away a predetermined distance from the gate electrode and being higher in impurity concentration than the second low concentration drain region (fig. 3 and col. 5, lines 65-67). The first conductive type is p-type, and the second conductive type is n-type.

The first drain region 14 and second drain region 15 have low impurity concentrations in comparison to the third drain region 16, which has a high impurity concentration. In fig. 3, an  $n^-$  symbol is used to indicate that the first and second drain regions 14, 15 have low impurity concentrations in comparison to the third drain region 16. An  $n^+$  symbol is used in the same figure to indicate that the third drain region 16 has a comparatively high impurity concentration with respect to the first and second drain regions 14, 15.

The second drain region 15 has a higher impurity concentration than the first drain region 14, and the third drain region 16 has a higher impurity concentration than the second drain region (col. 5, lines 58-67).

As discussed above, the first conductivity type is p-type, and the second conductivity type is n-type. The first, second, and third drain regions 14, 15, 16 and the source region 13 are of the second conductivity type, and the semiconductor substrate 11 is of the first conductivity type (fig. 3 and col. 5, lines 50-67).

The first, second and third drain regions 14, 15, 16 form a triple well structure in the semiconductor substrate 11 such that the third drain region 16 is the innermost well, the second drain region 15 is the middle well surrounding the third drain region, and the first drain region 14 is the outermost well surrounding the second drain region (fig. 3).

#### Regarding Claim 9

Kawaguchi et al. disclose a semiconductor device comprising: a semiconductor substrate 11; a gate oxide film 17 provided on the semiconductor substrate, a gate electrode 19 disposed on the gate oxide film (fig. 3); a first drain region 14 provided at one end of the electrode in the semiconductor substrate (fig. 3); a second drain region 15 provided in the first drain region, an outer boundary of the second drain region being disposed close to an outer boundary of the first drain region (fig. 3); a third drain region 16 provided in the second drain region, the third drain region being spaced away a predetermined distance from the gate electrode and being spaced far apart from the outer boundary of the second drain region (fig. 3); and a region 13 of the second conductive type provided at another end of the gate electrode, wherein the first, second, and third drain regions all having different impurity concentrations (fig. 3 and col. 5, lines 58-67).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. *Claims 2, 3, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawaguchi et al. in view of Wolf (Silicon Processing for the VLSI Era: Vol. 3).*

The Kawaguchi et al. patent lacks anticipation only in not teaching: that the first drain region 14 and the second drain region 15 are formed by using two kinds of second conductive type impurities - the second conductive type being n-type in this case, wherein the two kinds of second type conductive impurities have different diffusion coefficients; and that the first drain region and the second drain region are formed using phosphorus and arsenic ions, respectively.

Wolf discloses a double diffused drain (DDD) structure for an NMOS field effect transistor (pages 588-590). The DDD structure comprises a first drain region n<sup>-</sup> and a second drain region n<sup>+</sup>, wherein the first drain region has a lower concentration than the second drain region (fig. 9-26). The first drain region and the second drain region are formed using two kinds of n-type impurities, phosphorus and arsenic, which have different diffusion coefficients (page 588, 3<sup>rd</sup> par.). The first drain region is formed

using phosphorus ions, and the second drain region is formed using arsenic ions (page 588, 3<sup>rd</sup> par.).

The DDD structure in Wolf is formed by co-implanting phosphorus and arsenic ions into the same region using two separate implants, and performing a high temperature anneal. The anneal causes the phosphorus and arsenic ions to diffuse simultaneously resulting in the DDD structure. Because phosphorus diffuses faster than arsenic, the phosphorus ions are driven farther than the arsenic ions. This creates a less abrupt concentration gradient for the drain region (page 588, 3<sup>rd</sup> par.).

Because both Kawaguchi et al. and Wolf disclose an NMOS transistor comprising a drain region, wherein the drain region has a concentration gradient, the purpose disclosed by Wolf would have been recognized in Kawaguchi et al. by one having ordinary skill in the art.

One having ordinary skill in the art would have been motivated to modify the NMOS transistor of Kawaguchi et al., at the time the invention was made, such that the first and second drain regions 14, 15 are formed using phosphorus and arsenic, respectively, as taught by wolf, because this creates a less abrupt concentration gradient for the drain region.

### ***Response to Arguments***

9. Applicant's arguments with respect to claims 1-3 and 8-14 have been considered but are moot in view of the new ground(s) of rejection.

10. The response filed on 21 January 2003 has overcome the following objection(s) and/or rejection(s) made of record in the action mailed on 13 September 2002: the objection to the specification, and the rejection of claims 1-3 under 35 USC §112, second paragraph. Accordingly, the objection to the specification and the 112, second paragraph rejection are withdrawn.

***References Cited***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tung (US 6,198,131 B1) and Shirai (US 6,307,224 B1) are cited because the references disclose a MOS transistor, wherein the MOS transistor comprises a first low concentration drain region, a second low concentration drain region, and a high concentration drain region. See the PTO 892 form attached hereto.

12. Kitamura (US 5,981,997 B1) and Tung (US 6,392,274 B1) are cited only as art of interest.

***Conclusion***

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (703) 305-7646. The examiner can normally be reached Monday through Thursday, and alternating Fridays, from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (703) 308-4905. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

*JMJ*

April 2, 2003



AMIR ZARABIAN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800